2 December 2015

Pathways to community energy storage

The "Pathways to Community Energy Storage" roundtable discussion was held on 11 September at the Royal Society of Chemistry and organised with help from Ashden and the Energy Saving Trust. The aim of the event was to look at the role of energy storage for community energy, its potential, key challenges and barriers, and important developments. This summary is based on discussions during the event and does not necessarily represent the official position of the organisations or individuals involved in the discussion.

This workshop summary aims to provide a summary of important questions and issues raised during the discussion, namely:

1. Why energy storage?
2. What technologies are there now, and what innovations are on the horizon?
3. Where is energy storage deployed now?
4. What's the value of community energy storage?
5. What's the policy context?
6. What next? (What barriers need addressing?)

Key points:

- There are many different battery technologies being used and developed, the most dominant at the moment being lithium-ion.
- Electric vehicles are currently the one of the main drivers for development of battery technology.
- Deployment of energy storage is one of a range of options to strengthen the grid and enable the connection of more renewable energy, by managing peaks and troughs in power supply. It is also true, however, that upgrading the grid with more copper wiring does not address the same issue as energy storage: more copper allows more connections but will not help manage the variation in supply associated with renewable generation.
- One of the biggest drivers for domestic energy storage uptake would be time of use tariffs, which would enable people to store cheap energy at off-peak times and use it at peak times.
- Local supply of renewable energy with direct sale to local energy users could make energy storage very attractive to community energy groups.
- There could be opportunities for community energy storage through partnering with Distribution Network Operators (DNOs) to provide grid balancing services.
- Greater deployment of energy storage – where feasible – is important to demonstrate the technology, test business models and improve public perception and acceptance.

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1. The value of energy storage

There are various potential income streams for energy storage, namely:

- Storing energy from intermittent renewables at times when generation is high but demand is low, then selling it during peak demand
- Storing electricity at off-peak rates and selling at on-peak
- Load balancing services to network operators

Energy storage can be viable in situations where sufficient value is put on all its benefits. Cross-sector working is needed to identify those niches where this can be demonstrated; community energy projects could provide an ideal test-bed.

Promising niches:

Energy storage supporting solar PV: due to the variability of solar energy output, storage can be especially useful, enabling generators to sell energy on peak (i.e. early evening) rather than during the day, when it is generated.

Areas where the grid is weak and needs investment could provide opportunities for energy storage to play a role in grid strengthening/management.

There are situations where an active community energy group already owns renewable energy generating plant and could work with the DNO or supplier to develop energy storage capacity alongside it.

2. Current state of technology and future innovations

Lithium-ion is currently the leading technology due to its development for mobile electronics and electric vehicles. Sodium-ion based technology could provide opportunities for large scale, long term, lower cost deployment as sodium is a much more abundant element than lithium. Application of sodium based batteries is still in its infancy and further work is needed before their full potential is realised. A number of alternative technologies including lithium-air, flow-cells and liquid metal could potentially become viable in the long-term. More detailed information can be found on the US Energy Storage Association website: http://energystorage.org/energy-storage/energy-storage-technologies

Further information on life-cycle environmental impact and energy budgets of different battery technologies is needed. This issue was broached by a recent paper[1] which proposed a possible system for recycling lithium-ion batteries modelled upon that used for lead-acid batteries. Tesla also published a blog on the subject, detailing how the batteries from its electric vehicles are safely disposed of.

Better public information is needed on the relative merits of the different technologies and a useful resource comparing some of the different energy storage technologies can be found on the Energy Storage Website through the link above.

[1] The future of automotive lithium-ion battery recycling: Charting a sustainable course. 2014. Linda Gaines: http://www.sciencedirect.com/science/article/pii/S2214993714000037

3. Deployment

There has already been significant deployment of energy storage in Germany, and markets for deployment are developing in Korea, the US and Japan. These applications have been driven by the rapid growth of renewable energy generation (in particular solar PV) in Germany, but the drivers of deployment will likely vary from country to country.

Early stage deployment will be crucial to demonstrate how the technology works, to test business models and improve public perception and acceptance of energy storage.

4. Community energy storage

Well-established community energy groups provide useful partners for deployment of energy storage systems, as they are able to utilise multiple benefits including testing of the role of storage in demand-side management. Community energy groups are often driven by sustainability objectives or social issues, rather than straightforward return on investment. The sector has also shown an appetite for innovation where it can help to deliver those social and environmental aims.

Local direct energy sales by community groups could help to foster the market for energy storage. This area is generating a lot of interest in the community energy sector, but is currently faces regulatory challenges. In the present regime an energy storage device can only supply power to more than one user if the owner either has an energy supply license, the cost of which is prohibitive for community energy groups, or an agreement with an existing licensed supplier.

The key benefit of enabling local energy supply in the context of energy storage would be that community renewable energy generators could link local generation and storage with direct supply in their locality. This could enable development of viable, non-subsidy-dependent business models around secure, sustainable local energy supply, securing better income for energy generated through direct sale and also drawing income for grid balancing services

Energy supply regulation may change in the future, but there is likely to be a significant lead-time. In the meantime there may be opportunities to explore this model through partnerships with existing licensed energy suppliers as long as a business model that works for both parties can be developed.

6. Issues

There are a number of issues that will need to be addressed for energy storage to become viable at the community scale:

- Capital cost of energy storage systems needs to be reduced
- A stable policy framework is needed for community energy
- Social enterprise models for energy supply could help to unlock the potential of community-scale energy storage
- Deployment of more pilot projects is needed to demonstrate the viability of energy storage and test different business models

7. Next steps:

We are planning a follow-up event with parallel sessions on technology issues and deployment/role of storage in sustainable, local energy supply. This will build on the discussion at the first session. If you are interested in attending, please email Richard Walker from the Royal Society of Chemistry at: walkerr@rsc.org.

For further information and events on electricity storage generally we recommend linking up with the Electricity Storage Network - http://www.electricitystorage.co.uk/ - *"an industry group for companies and organisations that are active in the deployment, design, consumption and research of electricity storage for network connected applications."*

Useful resources/further reading:

- https://www.iea.org/publications/freepublications/publication/TechnologyRoadmapEnergystorage.pdf
- http://www.irena.org/DocumentDownloads/Publications/IRENA_REmap_Electricity_Storage_2015.pdf
- http://energystorage.org/
- http://www.edie.net/news/6/Scotland-storage-network-hydro-ev-batteries-Scottish-Renewables